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Impairments to the Giant Depolarizing Potentials After the Third Trimester Equivalent Ethanol Exposure in the Neonatal Rat

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Abstract

© 2016, Springer Science+Business Media New York.Ethanol exerts multiple adverse effects in the developing hippocampus resulting in the life-long neurological and behavioral deficits. However, the early disturbances in the hippocampal network function after exposure to ethanol remain largely unknown. Here, we examined the properties of the neonatal CA3 hippocampal network-driven giant depolarizing potentials using extracellular recordings of the local field potential and multiple units from the hippocampal slices prepared from the 5–11-day-old rats treated by ethanol in vivo (6 g/kg, intraperitoneally), 12 h before the slice preparation. Activity in hippocampal slices from the ethanol-treated animals displayed several abnormalities including a threefold increase in overall neuronal firing and profound, by nearly sevenfold, reduction of synchronization of CA3 units in giant depolarizing potentials. Thus, alterations in the hippocampal network function emerge shortly after the ethanol exposure and manifest in the enhanced excitation and severe impairments to the giant depolarizing potentials.

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Keywords

Alcoholism, Fetal alcohol syndrome, Giant depolarizing potentials, Hippocampus, Neonate